



Fire and Public Safety Panel  
Discussion Paper

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## **ISSUE OVERVIEW**

Renewable energy resources are categorized as: bio-fuel, biomass, geothermal, hydroelectricity, solar energy, tidal power, wave power, and wind power. Advancements in technology, manufacturing, increased energy consumption; growing awareness for sustainable renewable energy sources all lead to increased needs and installations. Whether we are generating energy on a small scale (housing, commercial buildings) or large scale (wind and solar farms, bio-fuel stations, fuel cell manufacturing) many aspects require education and training for emergency responders. Various alternate fuel methods may be generated and operated by individuals in cities or rural areas; it will be imperative that training/education address equipment, safety, and emergency response as well as zoning and site issues.

In order to tap into “free” fuel from abundant sources such as solar and wind, we must address the who, what, where, when, and how much (cost) in order to ensure the future health of our energy systems and the safety of the public and fire (emergency) services; and the well-being of our communities at large. The new “two-way” power grid introduces interactive operations with customers; remote maintenance; and controls. We all must be aware of the impacts, positive or otherwise, that a system’s technology, location, improvements, and potential hazards bring to our lives and environment. We must work cooperatively and collaborate on compliance measures that are not so restrictive as to be barriers or a hindrance; and ensures that safety is the priority.

## **SUMMARY**

The key for success in the planning, development and functional/operational use of renewable energy is through a collaborative approach with an objective understanding

of the challenges associated with renewable energy. In addition, obtaining consensus on how we address and overcome those challenges; while ensuring effective safety measures are uppermost in our thoughts, is paramount in the consideration of all individuals, organizations, and the environment affected by new technology and methodology.

## **BACKGROUND**

Since the 1980s, solar electricity has been used in many common household devices. In 2005 worldwide production of electricity from the sun was about 1,565 megawatts. The solar electrical industry is now actively selling and installing photovoltaic systems (PV) throughout California. In the latter part of 2009, there were approximately 50,000 individual solar projects scattered throughout the State on residential and commercial properties. By December, 2020, the projection is for a thirty-three percent (33%) renewable energy portfolio standard. Solar power is a key to that success.

The increased interest in renewable energy and in particular to emergency responders (firefighters) where the safety concerns were raised, most recently in California, in the use of the PV technology. Since PV systems are located on or near buildings to generate electricity they can be a hazard. The variety of installation locations (not always clearly identified) for PV were directly impacting fire fighting operations. Concerns included electrical hazards, electrical shock, increased dead load on roofs, tripping/slipping/falling hazards associated with working on roof structures, battery, and firefighter inhalation hazards. Ground mounted systems also provided other complications such as access (roads and fencing concerns) and wildland fire exposure hazards. Operating at incidents where PV systems (roof and ground mount) are present may require firefighters to adjust their actions and their tactics/strategies for roof top ventilation as well as wildland firefighting. These safety concerns brought about the fire service scrutinizing installations which may have lead to the perception that permitting was delayed or denied.

In 2007, with the Fire Services' concerns being included in the permitting processes, and to facilitate consistency and cooperation, the CAL FIRE - Office of the State Fire Marshal convened the Photovoltaic Solar System Task Force Committee (PV Task Force). Participants were drawn from the industry, as well as the fire service and in April, 2008 the PV Task Force completed the "Solar Photovoltaic Installation Guidelines." The guidelines concentrated on allowable roof access to perform fire suppression and rescue operations when PV panels are proposed to be installed on residential and commercial building roofs and provided a consistent approach that jurisdictions could adopt for reviewing installations. These guidelines were subsequently used as the base document

for the development and adoption of code provisions for the 2013 International Fire Code and inclusion into NFPA 1 (National Fire Protection Association's Fire Code) adoption process. The focus for CAL FIRE – Office of the State Fire Marshal then turned to the fire service operational awareness training, tasking Subject Matter Experts (fire service/industry representatives) to develop a training module to be delivered throughout the State by qualified instructors. The resultant module: *Fire Operations for Photovoltaic Emergencies* is currently available for fire service training.

## **CHALLENGES**

The challenges for emergency responders when operating around or with any power generating device is no different than other electrical systems, the components are hazardous if the system is compromised or directly involved in fire or the protective coverings on the components are damaged. The primary concern is the danger of electrical shock. PV systems have the capacity to generate electricity in the range of 600 volts; this voltage even at low amperages is extremely dangerous or may be hindered by obstructions to perform roof ventilation tactics that are critical to safely removing hot gases and smoke from the interior of a structure fire; and/or safely extinguishing wildland fires in areas with large PV ground mounted systems. It is imperative for firefighters to be taught to recognize and understand the hazards and increase awareness for firefighter safety.

The deployment of PV is an example of a challenge in the regulatory code community. Although not a new technology, model building codes may not adequately address the installation of PV arrays (connected modules) as they are attached to existing structures or ground based. Their impact on established fire regulations, protection or limited access to these arrays for untrained civilians are examples of practical issues which need to be addressed in standards and codes which are the basis for acceptance/compliance by enforcement officials.

For other technologies such as wind turbines, large pieces of falling, propelled, and hot debris are firefighting hazards that can cause extensive fire control challenges as well as firefighter safety concerns when working in, around and/or under these types of very large structures. Knowing when and where to enter a firefighting situation is reliant on understanding the equipment, the hazards it can present and the expectations for fire control.

## **PROMISING SOLUTIONS**

Acknowledging the challenges and issues affecting all professions and stakeholders involved in renewable energy technology is a first step to developing promising solutions. This acknowledgement has taken place through the development of training and educational materials directed at emergency responders and their tactics and strategies for fire fighting. As mentioned, there is now a model PV installation guideline that is used by local government to address fire-ground operations concerns. Development of the guideline utilized a collaborative methodology with notable cooperation from the PV industry and fire service. Not only does it assist in providing an installation standard but it also provided for an opportunity to raise the level of awareness and understanding of participants in the dynamics of each profession and the operational needs for public safety.

While the deployment of PV represents a challenge, it is also an example of positive efforts that involve ongoing collaborative activities to find practical solutions. Manufacturers, industry trade groups, code enforcement and fire service officials are actively working with standards and code writing organizations to develop appropriate protocols to address both public and firefighter safety. Recently, members of California's fire service have come together with CAL FIRE – Office of the State Fire Marshal to discuss and develop a regional approach for ground-mounted photovoltaic. This assistance in the development of regional approaches provides a level of public and firefighter safety consistency of great benefit for operational needs as well as industry expectations.

### **IMPORTANT QUESTIONS TO PURSUE**

There are many concerns and/or questions with the fire service and renewable or alternate energy sources as Governor Brown "calls for new approaches.....that will introduce new technology; affect land use; and more than likely will require or impact building and fire codes". Emergency responders will need to know/understand how to access small, large, and/or mega-systems or turbines; what types of containment and resources apply (water, property boundaries); what are the security, prevention and operational measures associated with electrical, chemical or other hazards?

***What are the challenges for the emergency responders (fire service) from different technologies?***

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electrical shock. PV systems have the capacity to generate electricity in the range of 600 volts; this voltage even at low amperages is extremely dangerous to firefighters as they perform roof ventilation tactics and operations that are critical to safely removing hot gases and smoke from the interior of a structure fire; and safely extinguishing wildland fires in areas with large PV ground mounted systems. Over haul procedures can involve the “hands on” movement of building materials to check for hot spots. A PV array or its components may be damaged due to the fire exposure and may be an electrical shock hazard. Fire fighters also interact with this technology to extinguish wildland fires in areas with large PV ground mounted systems. It is imperative for firefighters to have the resources and knowledge to recognize/understand the hazards and ultimately increase firefighter safety.

For other technologies such as wind turbines, large pieces of falling and hot debris can cause firefighting hazards that can cause extensive fire control challenges as well as firefighter safety concerns when working around/under pieces of expelled parts. Fire fighters are also exposed to potentially dangerous situations during their performance of overhaul operations and equipment removal following a fire event. When and where to enter a firefighting situation is reliant on understanding the equipment, the hazards it can present and the expectations for fire control.

***How do fire and public safety services affect deployment of renewables in different settings?***

The fire services primary responsibility is for public safety and holds a key role in the development, adoption, and implementation of regulations/codes that provide safety to the public and to emergency responders. The regulations/codes may not include every aspect or foreseeable safety challenge associated with renewable energy. As technology advances and is deployed, fire and public safety are obligated to enforce public safety codes that may impact the industry. It is not feasible that every conceivable situation is placed within the code therefore the fire service must provide (discuss, develop, implement) the required education/information to address safety issues. This process may be perceived as slowing down the deployment of the renewable energy systems; however, every community must take the time to address their safety needs as necessary to protect their lives, property, and emergency responders.

***Consistent deployment of renewable power/energy raises the question as to who is developing regulations/code, policies, and guidance documents. Is there a common theme for this development to move towards a standard approach***

*amongst fire safety officials? How do we connect and coordinate with other regulatory agencies?*

Organizations throughout the country have been working together to share a common approach to renewable power. The goal is to recognize the base needs of public safety, consolidate those needs, coordinate the code development efforts and provide a consistent approach to the review and approval for the deployment of renewable energy sources. It is important to note that California has been at the forefront of this effort, particularly in the past five years. Our work continues with involvement in research and testing. We've identified hazards to firefighters and provided sound scientific information for the development of consistent regulations and code. During this time, the California fire service has continued to reach out to the industry in developing training materials to make emergency responders aware of the intricacies and systems of renewable energy sources and the impact these components have on their work environment.

At the national level, California continues to share its cooperative efforts with other emergency services organizations to assist with the movement towards understanding, accepting, and for the safe operations concerning renewable energy/power.